TABLE 2.—*Instrumental data*

Station	Under direction of—	Eppley pyrheliometer number	E. m. f. per gram-calorie, mv.	Resistance, ohms	Registers	Resistance, ohms	Full-scale deflection	Notes
1. Fairbanks, Alaska	U. S. Weather Bureau	235	7.46	84.8	Engelhard	151	30 ma	Number unknown. (C. I. C.)
2. Lincoln, Nebr.	do	296	1.386–1.404	32.0	Leeds & Northrup		4 mv	Normal incidence also. (C. I. C.)
3. Madison, Wis.	do	359	1.874–1.889	36.0	do		4 mv	Do.
4. New York, N. Y.	do	191	5.580–5.658	84.2	Engelhard, 30749	137	27.8 ma	Register needs replacing. (C. I. C.)
5. Washington, D. C.	U. S. Weather Bureau, American University.	447	1.892–1.916	37.0	Bristol, model 527, serial 567. Engelhard, 27346		4 mv	Dr. E. W. Engel.
6. Albuquerque, N. Mex.	U. S. Weather Bureau, airport	316	8.702–8.845	113.0		132	28.6 ma	Engelhard soon to be replaced with potentiometer.
6a. Albuquerque, N. Mex.	do	656	1.429		Leeds & Northrup			(Should be installed by end of 1941.)
7. Fresno, Calif.	U. S. Weather Bureau	223	7.160–.7230	82.8	Engelhard, 26209	134.3	30.8	Excellent station.
8. Chicago, Ill.	do	358	8.480	111.0	Engelhard, 27273	139.5	50.4	Engelhard needs replacing.
9. Bismarck, N. Dak.	do							Station to be opened shortly.
10. Nashville, Tenn.	do							Do.
11. Miami, Fla.	do							Do.
12. San Juan, P. R.	U. S. Weather Bureau, Puerto Rico.	445	1.90	36.0	Modified potentiometer			Dr. G. W. Kenrick.
13. Ithaca, N. Y.	Cornell University	295	1.813	30.0	Leeds & Northrup			Dr. A. J. Heinicke, department of pomology.
14. Riverside, Calif.	University of California	301	1.389–1.403	34.0	Engelhard, 30749	172	14.7 ma	Dr. E. R. Parker, citrus station.
15. Twin Falls, Idaho	U. S. Bureau of Plant Industry.	386	8.981–9.084	111.0	25166	129.7	28.9 ma	Station in very poor shape—should have new instruments.
16. Blue Hill, Mass.	Harvard	498	1.670–1.693		Leeds & Northrup, 251588		2.8 mv	Alternate recorders now and then. Dr. Charles F. Brooks.
17. State College, Pa.	State College	(?)	0.662	(?)	Leeds & Northrup circular sheets.			Dr. H. Landsberg. Pyrheliometer has had new cover; very inefficient outfit.
18. New Orleans, La.	Tulane University	(?)	8.051–8.103	(?)	Leeds & Northrup, 80 div., ½ hour lines.		16.0 mv	Dr. Henry Laurens.
19. La Jolla, Calif.	Scripps Institute of Oceanography, University of California.	335	7.554–7.656		Englehard		30.8 ma	Dr. George F. McEwen.
20. Torrey Pines, Calif.	U. S. Bureau of Plant Industry.	518	8.035–8.112		Leeds & Northrup		16. mv	Dr. L. A. Richards.
21. Indio, Calif.	do	519	7.903–7.968		do		16 mv	Dr. L. A. Richards or Dr. Aldrich.
22. Washington, D. C.	National Bureau of Standards	387	8.36		do		(?)	Pyrheliometers need restandardizing. 50-junction.
23. Washington, D. C.	do	393	1.88		do		(?)	10-junction.
24. Friday Harbor, Wash.	University of Washington, Seattle, Wash.	262	8.71		Engelhard			Dr. C. L. Utterback. Suggested that they have their pyrheliometer leveled. No reply.
25. Newport, R. I.	Eppley Laboratory	362 489 389 391	1.589 1.382 7.685 7.960		Various potentiometers			Mr. Roy Anderson, Manager, or Mr. William R. Gray.
26. Cambridge, Mass.	Massachusetts Institute of Technology.	434	8.52		Leeds & Northrup			Dr. Hoyt C. Hottel.

TROPICAL DISTURBANCES OF SEPTEMBER 1941

By HOWARD C. SUMNER

[Weather Bureau, Washington, October 1941]

The first tropical disturbance of the 1941 hurricane season appeared in the northern Gulf of Mexico on the evening of September 11. This is the first time in over 25 years that the North Atlantic area has been free from tropical disturbances until so late in the season. Annual records, from 1887 to the present time, show that only on two other occasions have tropical storms failed to develop before the 11th of September. In 1907 and 1914 the first tropical disturbances of the season were observed on September 16 and September 14, respectively.

After the unusually late start, four disturbances developed in rapid succession, between September 11 and 23, two of which were accompanied by winds of full hurricane force. The last three of these disturbances were in progress at the same time, with advisories being issued simultaneously by the supervising centers at Washington, New Orleans, and San Juan.

September 11–15, 1941.—A Gulf disturbance of slight intensity appeared on the morning of September 11, and was centered at 7 a. m.[1] about 120 miles southeast of Port Eads, La. The center moved very slowly in a west-northwesterly direction toward the north Texas coast and moved inland, between Galveston and Port Arthur, the night of September 14–15, resulting in a series of squalls at Port Arthur.

The lowest barometer reported during the short 5-day course of this storm, 1,002.7 millibars (29.61 inches), accompanied by a force 8 wind (Beaufort scale), came from a ship near 28°06′ N., 90°18′ W., on September 13.

On the coast the highest wind velocity registered was 31 miles per hour from the east at Port Arthur and the lowest barometer 1,007.5 millibars (29.75 inches) at 4:30 p. m. (C. S. T.) on the 14th at the same station. Rainfall for the 2-day period (14–15) at Port Arthur was 1.52 inches.

This disturbance was sufficiently threatening on the 13th for warnings to be issued to people in low-lying areas; but during the last 24 hours before it crossed the coast it decreased greatly in intensity and no property damage or injuries were reported.

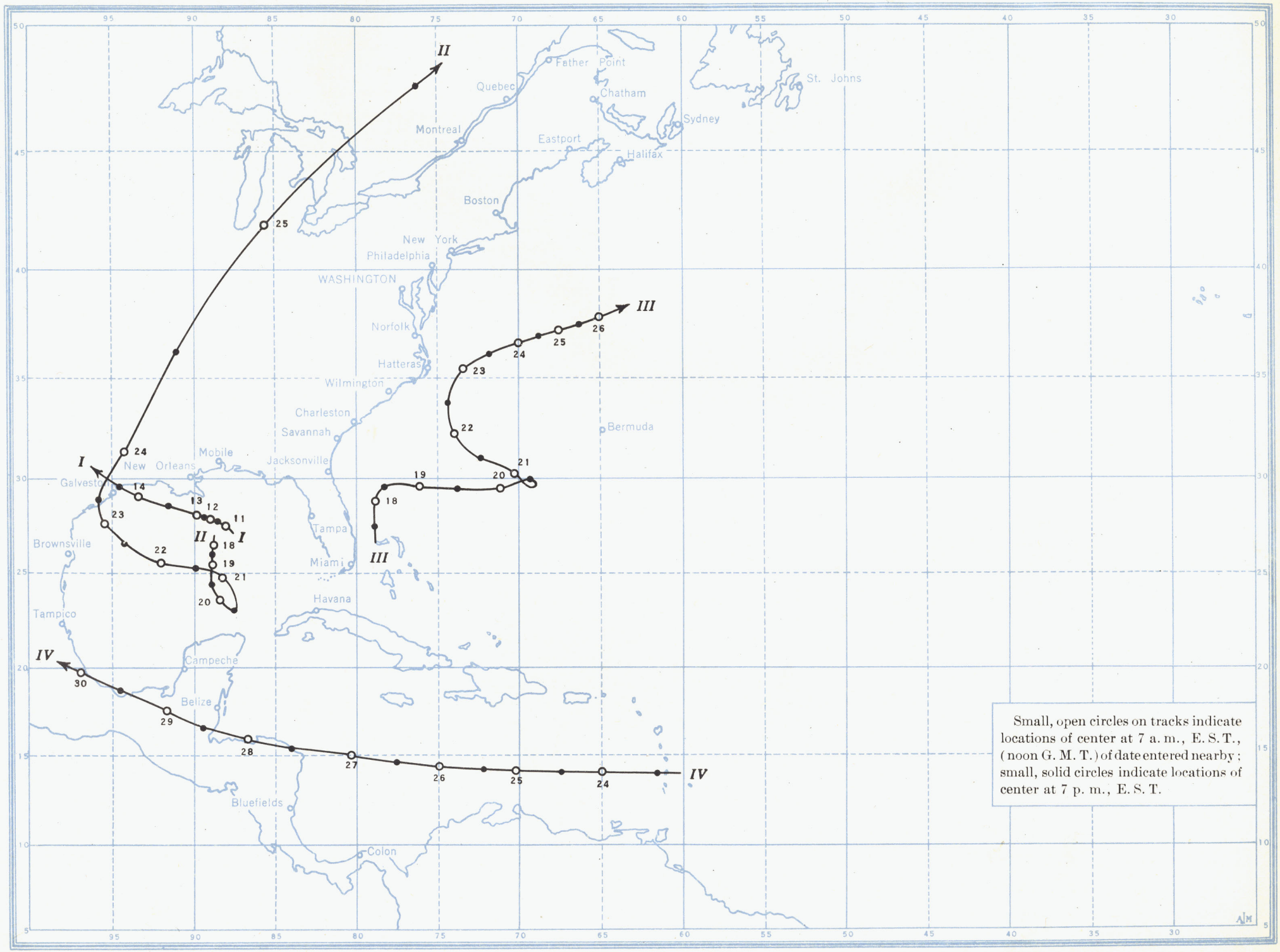
September 18–26.—This hurricane was first noted as a disturbance of slight intensity about 180 miles south of Port Eads, La., on September 18. For 48 hours the center drifted gradually southward toward the Yucatan coast with winds increasing to gale force. During the night of September 20–21 the storm turned, and moving northward retraced its path until, on the evening observation of the 21st, it was again near the region where first detected. It then took a northwestward course through the western Gulf of Mexico and moved inland on the Texas coast near Matagorda at 3:25 p. m. (C. S. T.) on September 23.

A ship near 27°06′ N., 93°42′ W., on September 22 reported a northeast wind, force 12, and a low barometer reading of 985.8 millibars (29.11 inches).

On the coast, Texas City reported the highest recorded

[1] Times mentioned are E. S. T. unless otherwise indicated.

Tracks of North Atlantic Tropical Storms, September 1941



wind velocity, 83 miles per hour. Estimated winds up to 100 miles per hour came from several points nearer the storm center.

The following excerpts from a report by G. P. Rusmisel, of the Galveston office, relate to conditions at that station during the approach and passage of the storm:

> There was little characteristic sky appearance prior to the advent of the storm, the sky being mostly clear until lower clouds appeared suddenly between 6 and 7 a. m. C. S. T., on the 22d with alto-cumulus and alto-stratus overcast showing through breaks occasionally during the day. By late afternoon of the 22d the sky became completely overcast with low clouds of bad weather which predominated throughout the remainder of the storm. * * * Tides had been somewhat above normal at Galveston since the minor disturbance of September 11–15 and began to rise again on the 21st, and more rapidly to a crest of 6.7 feet at 8 p. m. and 10 p. m., C. S. T. on the 22d, then falling to 5.0 feet at 1 p. m. of the 23d. Tides rose again thereafter to a crest of 7.0 feet at 9 and 10 p. m. C. S. T. on the 23d, after which they subsided rapidly. * * *
>
> The sea was rather light at about 10 swells per minute until the storm moved toward the Texas coast, after which an increase set in becoming very heavy and reaching 5 swells per minute at the height of the storm. * * *
>
> Tidewater covered all of the Galveston Island beaches, much of the island beyond the seawall, and entered the lower residential and business sections as backwater from the bay. * * * Tidewater also covered the municipal airport to a depth of approximately 1 to 3 feet and was about 6 inches deep on the floor of the airport administration building and in the C. A. A. communications station room, putting that office out of commission until after the water receded and power and telephone service was restored the evening of the 25th.

Recurving to the northeastward after crossing the Texas coast the storm center passed slightly west of Houston. The lowest pressure registered along the path of the hurricane, 970.5 millibars (28.66 inches), was observed at Houston Airport at 11:08 p. m. of the 23d. The passage of the low pressure was accompanied by winds estimated at 75 miles per hour; a recorded velocity becoming impossible because of power failure.

Progressive movement of the storm increased rapidly as the center moved up the Mississippi Valley and passed over the Canadian boundary in the Lake region.

Available sources estimate property damage at well over $2,000,000. The rice crop in the region affected was ruined, and has been estimated as a loss of $4,000,000. About 25 to 30 percent of the cotton crop had been picked in this section. Half of that remaining in the fields has been reported lost.

Warnings on this storm were given the widest possible dissemination by radio, press, telegraph, and telephone. As a result of these warnings an estimated 25,000 persons left their usual place of abode for safer surroundings. The smaller towns along the coast were practically deserted. It is noteworthy that, so far as is known, only four lives were lost, either directly or indirectly, as a result of this storm which traversed a low-lying region where without warning thousands would have been left to the mercy of wind and tide.

September 18–26.—On the morning of the 18th, disturbed conditions and squally weather were observed over the Atlantic east of Florida, with indications of a center of circulation about 150 miles east of Titusville. During the 18th this disturbance moved in a direction slightly north of east with highest wind, force 7, reported in squalls. It then curved sharply to the eastward and by the morning observation of the 20th appeared as a very large elongated low pressure area extending from the Bahamas to Bermuda with center about latitude 29°30′ N., longitude 71°00′ W. During the night the center executed a right-hand loop and headed northwestward toward the North Carolina coast.

Along the path of this storm from September 20 to 23 several ships reported winds force 11, with the lowest barometer observed, during this period, 995.3 millibars (29.39 inches) at 30°00′ N., 70°10′ W. on September 20.

A ship bound from Curacao to New York had two encounters with this storm; first near 30°11′ N., 71°45′ W. on the morning of September 20, when at 4 a. m. a low barometer of 1,006.4 millibars (29.72 inches) was recorded, and again 2 days later near 34°13′ N., 75°09′ W., with the barometer falling to 1,004.7 millibars (29.67 inches) at 8 p. m. on September 22. During the interval between these observations the center of the storm, which during the first encounter had been moving eastward south of the vessel, turned in its track and overtook the ship from the southeast (track III, chart 1). Force 8 winds were encountered on both occasions.

Late on the 22d the storm recurved to the northeastward in about 33°30′ N., 74°00′ W., passing about 150 miles east of Hatteras, and dissipated in the western North Atlantic on the 26th.

This storm did not develop hurricane intensity but was attended by strong winds and gales which caused considerable delay in North Atlantic shipping.

Timely small craft warnings kept small boats along the coast out of danger. No destructive winds occurred on land.

September 23–30.—This storm was first noticed as a very slight disturbance about 75 miles northwest of Barbados in the early afternoon of September 23. Moving almost due west it passed slightly south of St. Lucia and into the Caribbean Sea, where it quickly developed hurricane intensity.

On the morning of the 25th the hurricane-buffeted freighter m. s. *Ethel Skakel* flashed a "sinking" message from 125 miles north of Aruba, Dutch West Indies, and later went down with her cargo of steel rails near 14° N., 70° W. Of the crew of 33 men, only 13 were reported rescued, the other 20 being presumably lost.

Two other vessels sent distress signals from locations near the path of the storm, one of which was later reported lost with her entire crew of 27 men.

Taking a course slightly north of west the storm then moved across the western Caribbean and by the morning observation of the 27th was centered in the vicinity of Cape Gracias, Nicaragua.

Through the courtesy of Jose Carlos Millas, Director of the National Observatory at Havana, Cuba, the following report has been received:

> Today (October 1), we have been able to establish contact with Cape Gracias. The town was destroyed and our station is practically lost. As I had advised the Governor that the hurricane would pass through that place the day before, all the people fled, except 11, of which 3 were drowned. The observer stayed until 9:45 a. m. (of the 27th), at which time he sent his last message. The observation building also came down. The sea flooded the town, reaching a height of about 2 meters, wrecking everything there. The inhabitants have come back to what is left of the place.

From Cape Gracias the hurricane moved with slightly increased speed across extreme northern Honduras, passing into the Gulf of Honduras, near La Ceiba, about 9 a. m. (local time) of the 28th, with lowest barometer reported 992.9 millibars (29.32 inches), and still accompanied by winds of hurricane force. A vessel, located 16 miles north of Ceiba, reported winds estimated at 100 miles per hour, after passage of the center. The storm moved inland again over the coast of British Honduras, about 70 miles south of Belize, during the afternoon of the 28th, and 24 hours later emerged into the Bay of Campeche. Continuing to move west-north-

westward the disturbance decreased rapidly in intensity as it approached the Mexican coast, and moved inland, for the third time, as a weak depression near Vera Cruz on September 30.

Complete information regarding loss of life and property damage for this storm is not available at this time, but since it was of hurricane intensity, damage in the Central American countries affected was probably severe.

The tracks of these tropical disturbances of September 1941 are shown on the accompanying chart.

NOTES AND REVIEWS

W. E. KNOWLES MIDDLETON. **Visibility in Meteorology.** 2nd Edition. Toronto (University of Toronto Press), 1941. 165 pp., 32 figs.

The second edition of this monograph is a comprehensive summary on the theory and practice of the measurement of the visual range. It is still the only book devoted wholly to this subject which, in some respects, has been neglected in this era of expanded transport.

The concisely and carefully written theoretical portions of the first edition have been largely retained in this new issue, with some small improvements in notation, and several important brief additions. Among the topics discussed in the new material are the following: Variation of the extinction coefficient with visual range and with size of water droplets, for different colors; nature of atmospheric aerosols; properties of the eye in the light- and dark-adapted states; and visual range in fog, and its relation to water content.

The "practical" part of the first edition has been superseded by a largely rewritten version. In connection with this, a variety of telephotometers and transmission meters for measuring the atmospheric extinction coefficient are described. Great expansion in scope of the chapter relating to the estimation of the visual range in practice has enabled the author to present a comparative discussion on various visibility scales, a matter of considerable interest to those concerned with the technique of making observations for airway and synoptic reports.

A new chapter on "Forecasting the visual range," and a new appendix on "The visual range of coloured objects" contain material of great practical and theoretical importance.

Revision of the book has increased its size by 61 pages, and the number of figures by 23. The extensive bibliography on visibility and pertinent additional topics given in the work now covers 342 items.—L. P. H.

SVERRE PETTERSSEN. **Introduction to Meteorology.** New York (McGraw-Hill Book Co.), 1941. ix, 236 pp., 142 figs.

This book is intended as an elementary introduction to general meteorology, for students without previous knowledge of the subject. No mathematics beyond an occasional simple algebraic formula is used; and the elementary physics involved is explained in the text. The emphasis is on synoptic and aeronautical meteorology; but nearly all the more important topics of meteorology proper (i. e., exclusive of optical, electrical, and acoustic phenomena of the atmosphere) are at least briefly discussed.

The opening chapters describe the general nature and structure of the atmosphere, and the principal types of meteorological observations and instruments. A chapter is then devoted to evaporation, condensation, and precipitation, followed by two chapters on adiabatic processes in the atmosphere and atmospheric stability. The next chapter discusses the processes by which transfers of heat and changes of temperature are brought about in the atmosphere, and some of their effects—including modification of lapse rates, occurrence of convection, thunderstorms, fog formation, and ice accretion on airplanes.

A chapter on atmospheric circulation—winds, their relation to pressure distribution and their variation with height; the planetary circulation; turbulence; etc.—is followed by two chapters on air masses and fronts, and a chapter on cyclones (extratropical and tropical) and anticyclones, with a brief allusion to tornadoes and waterspouts. The next three chapters are devoted to the drawing and analysis of synoptic maps, and the forecasting of weather, in accordance with the most recent methods, illustrated by a number of actual examples.

The book concludes with a chapter on climate and the climates of the earth, and one on the history of meteorology. A list of recommended books for further reading, a few short tables, and an index are appended.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR SEPTEMBER 1941

[Climate and Crop Weather Division, J. B. KINCER in charge]

AEROLOGICAL OBSERVATIONS

By HOMER D. DYCK

Surface temperatures for September were above normal generally over the eastern half of the country and below normal over the western half with the exception of a strip along the Pacific coast which recorded above normal warmth. Plus departures of from 4° to 6° F. were recorded in the southern Lake region, the Ohio Valley and Tennessee and the Middle Atlantic States, while minus departures of from 4° to 6° F. were recorded in the Great Basin.

At 1,500 meters above sea level the 5 a. m. resultant winds for September were from directions to the south of normal over most of the country east of the Rocky Mountains and north of normal at this level over the rest of the country. At 3,000 meters the morning resultant winds were more northerly than normal along the Middle and North Atlantic coast and west of the Rocky Mountains and more southerly than normal elsewhere. At the 5,000 meter level, a comparison of the 5 p. m. resultant winds for September with the 5 a. m. normals shows that the late afternoon resultants were more southerly than the corresponding morning normals at about half of the stations for which these data could be compared.

It is interesting to note that the above-normal temperatures in the eastern half of the country were accompanied by more southerly than normal wind resultants generally and the below normal temperatures in the West coincided with more northerly than normal resultants. Exceptions to this correspondence are the strips along each coast.

Resultant wind velocities at 1,500 meters were above normal over most of the country with the exception of the southern Plateau region and the Middle Atlantic States, where they were slightly below normal. At 3,000 meters resultant velocities were above normal except over the Middle and South Atlantic States, while at 5,000 meters the 5 p. m. resultant velocities were higher than the corresponding 5 a. m. normals over the same regions.

At 1,500 meters the 5 p. m. resultant winds for the